



# Minnesota Pollution Control Agency

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September 19, 2007



TO: Participants in the Northern Class I Areas Consultation Process

RE: Northern Class I Areas Consultation Conclusion

As you are aware, Minnesota is home to two federal Class I areas, Voyageurs National Park (VNP) and the Boundary Waters Canoe Area Wilderness (BWCAW), located in the northern portion of the state. Under the federal Regional Haze Rule (40 CFR 51.300-309), the State of Minnesota is required to work to improve visibility in these two areas, with a goal of no man-made visibility impairment by 2064.

Under the portion of the Regional Haze regulations at 40 CFR 51.308(d)(1)(iv), states with Class I areas are required to develop reasonable progress goals (RPG) for visibility improvement at their Class I areas and associated measures to meet those goals, in consultation with any other State or Tribe that may reasonably cause or contribute to visibility impairment in those areas. This letter provides information on how Minnesota intends to address the reasonable progress goals, identification of the states that cause or contribute to visibility impairment in Minnesota's Class I areas, and our expectations for continued coordination with those states on haze-reducing strategies.

Beginning in 2004 and 2005, a number of discussions were held between state and tribal representatives in the upper Midwest concerning air quality planning to address regional haze in the four Class I areas in Michigan and Minnesota. Formal discussions geared toward the State Implementation Plans (SIP) consultation requirements began in July 2006, in a conference call among representatives from Iowa, Michigan, Minnesota, North Dakota, Wisconsin, the Mille Lacs and Leech Lake bands of Ojibwe, and Federal Land Managers (FLM), Regional Planning Organization (RPO) and U.S. Environmental Protection Agency (EPA) personnel. It was decided that other potentially contributing states should be asked to participate in the consultation process, and that consultation should continue through ongoing conference calls during the development of the regional haze SIP. Minutes of the conference calls and other documentation can be found on the Lake Michigan Air Directors Consortium/Midwest Regional Planning Organization (LADCO/MRPO) Web site.<sup>1</sup>

The group consulted on technical information, producing a document entitled *Regional Haze in the Upper Midwest: Summary of Technical Information*, which lays out the basic sources that cause and contribute to haze in the four Northern Class I areas, as agreed to by all the participating states.<sup>2</sup>

<sup>1</sup> [http://www.ladco.org/Regional\\_haze\\_consultation.htm](http://www.ladco.org/Regional_haze_consultation.htm)

<sup>2</sup> <http://www.ladco.org/Final%20Technical%20Memo%20-%20Version%205d1.pdf>

Based on the technical information contained in this document and other supporting analyses, Minnesota has determined that, in addition to Minnesota, Illinois, Iowa, Missouri, North Dakota, and Wisconsin are significant contributors to visibility impairment in VNP and the BWCAW. Attachment 1 to this letter provides a summary of how Minnesota reached this conclusion.<sup>3</sup>

The Minnesota Pollution Control Agency (MPCA) has not yet completed modeling to determine the RPG for these two Class I Areas. However, because of the varying timelines and different non-attainment issues impacting Minnesota and other contributing states, Minnesota intends to submit a RPG resulting from implementation of the minimum interim control measures Minnesota would consider to be reasonable. This decision reflects the need for more in-depth analysis before additional control measures can be determined to be reasonable. The RPG would be revised in the Five Year SIP Assessment to reflect final control measures.

In addition to on-the-books controls, such as the Clean Air Interstate Rule (CAIR), Minnesota expects the RPG to reflect Best Available Retrofit Technology (BART) determinations in Minnesota and surrounding states (where known), the plan for a 30 percent reduction in combined sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) emissions in Northeastern Minnesota, voluntary emission reductions planned by Minnesota utilities beyond those predicted from CAIR, and, where known, any additional control measures undertaken in other states for regional haze or attainment purposes. The MPCA expects that the modeling information needed to set the RPG would be available by October 2007.

Minnesota commits to evaluating additional control measures and implementing those that are reasonable under the four factors listed in 40 CFR 51.308(d)(1)(i)(A) in the 2008 SIP. Minnesota expects that additional control measures may be found to be reasonable, and commits to including a plan for implementation of those additional reasonable measures in the Five Year SIP Assessment. Minnesota asks the five other significantly contributing states to make these same commitments for further evaluation and implementation of reasonable control measures.

In particular, Minnesota asks Iowa, Missouri, North Dakota, and Wisconsin to evaluate further reductions of SO<sub>2</sub> from electric generating units (EGU) in order to reduce SO<sub>2</sub> emissions by 2018 to a rate that is more comparable to the rate projected in 2018 for Minnesota, approximately 0.25 lbs/mmBtu. Minnesota believes that Illinois is already in the process of meeting this goal. Emission reductions in Wisconsin are particularly important, as Wisconsin is the highest contributor outside Minnesota to visibility impairment in Minnesota's Class I areas.

Minnesota also asks North Dakota to evaluate the potential for reductions of NO<sub>x</sub> from EGUs due to predicted higher NO<sub>x</sub> emission rates compared with Minnesota and other contributing states. Illinois, Missouri, and Wisconsin are in the process of evaluating NO<sub>x</sub> emission

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<sup>3</sup> Minnesota is relying primarily on data analysis and technical work done by MRPO and CENRAP.

reductions for their ozone SIPs. Minnesota would expect these three states to share information on the NO<sub>x</sub> controls being undertaken as part of those ozone SIPs.

Minnesota acknowledges that each state is in a unique position; for example, North Dakota has a different regulatory background and a different fuel mix than other contributing states. Minnesota's use of emission rates to point towards areas where additional emission control strategies should be investigated does not mean that Minnesota expects all the contributing states to achieve the same emission rates. However, the contributing states with higher emission rates should evaluate potential control measures, and should, in their initial SIPs or Five Year SIP Assessments, show either enforceable plans to reduce emissions or a rationale for why such emission reductions are not reasonable (e.g., an overly high cost in \$/ton or \$/deciview, or lack of visibility improvement).

Minnesota, in turn, also commits to a more detailed review of potential emission reductions from large Industrial, Commercial, and Institutional (ICI) Boilers and other point sources (such as reciprocating engines and turbines) with regulations or permit limits developed by 2013 and included in the Five Year SIP Assessment if control measures on these source categories appear to be reasonable. Minnesota asks the five contributing states to make a similar commitment.

It is the intent of Minnesota to proceed with the development and submittal of a Regional Haze Plan which includes the aforementioned RPG and expectations for contributing states. Minnesota commits to continuing work with the other states to review and analyze potential region-wide control strategies and emission reductions plans and to continue on-going assessments of progress towards visibility improvement goals.

Minnesota asks that any additional control measures found to be reasonable will be included in each state's SIP or Five Year SIP Assessment in an enforceable form. This will ensure that the control measures are on track to be implemented by the 2018 deadline for submittal of SIPs covering the second phase of the Regional Haze process.

Minnesota believes that the consultations conducted to date satisfy the consultation process requirements, providing for consistency between state SIPs and allowing each state to move forward with SIP preparation and submittal. As necessary, Minnesota will engage in future consultation to address any issues identified in the review of the Regional Haze SIPs, any additional technical information, and to ensure continued coordinated efforts among the Midwestern states.

Attached to this letter is an outline of the reasonable progress discussion to appear in our SIP and additional supporting tables and graphs.

In order to document the consultation process, the MPCA is asking that the State and Tribal recipients of this letter respond within 30 days with a letter documenting that these consultations have taken place to the satisfaction of your State or Tribe, or detailing areas where additional

consultation should occur. Those states that Minnesota has identified as additional contributing states should respond with your agreement or disagreement with the determination of contributing states and the additional controls strategies that will be evaluated.

Thank you for your participation and contributions in this consultation process. Your time and efforts are appreciated. If you require additional information regarding this matter, please contact John Seltz at 651-296-7801 or [john.seltz@pca.state.mn.us](mailto:john.seltz@pca.state.mn.us).

Sincerely,

A handwritten signature in black ink, appearing to read "Brad Moore", with a stylized flourish at the end.

Brad Moore  
Commissioner

BM/CN:ld:tgr

Attachments

## Attachment 1: Supporting Technical Information – Determination of Contributing States

Minnesota used the LADCO 2002 – 2003 Trajectory Analyses and the LADCO 2018 PSAT analysis, using a 5% threshold of contribution from either analysis to either of Minnesota's Class I areas, to define a contributing state. Based on this information, the States identified as contributing to visibility impairment in Minnesota's Class I Areas are: Minnesota, Wisconsin, Illinois, Iowa, Missouri, and North Dakota.

The table below documents the percent contribution to visibility impairment by the States that have participated in the Northern Class I consultation process, estimated from 2000 – 2003 LADCO trajectory analysis, with supporting information from the CENRAP 2002 PSAT model of the 20% worst days.<sup>4</sup>

### State Impacts on Minnesota's Class I Areas – Baseline Period

LADCO Trajectory Analyses (2000-2003)			CENRAP PSAT Modeling (2002)	
	BWCAW	VNP	BWCAW	VNP
Michigan	0.7%	1.6%	2.6%	1.4%
Minnesota	37.6%	36.9%	25.4%	27.6
Wisconsin	11.1%	9.7%	8.6%	5.6%
Illinois	2.7%	1.2%	7.3%	3.7%
Indiana	1.2%		3.8%	1.8%
Iowa	7.4%	10.2%	3.9%	3.8%
Missouri	3.3%	0.3%	2.7%	2.1%
N. Dakota	5.9%	7.1%	4.8%	7.1%
TOTAL	69.9%	67.0%	59.2%	53.1%

The following table documents the percent contribution from these same states projected for the future based on LADCO's 2018 Particulate Matter Source Apportionment Technology (PSAT) analysis, with supporting information from the CENRAP 2018 PSAT model of the 20% worst days.<sup>5</sup> Although in some cases the percentage impacts predicted by CENRAP are lower than those predicted by the MRPO PSAT analysis (Iowa, Missouri), the identified states remain the higher contributors. The relative order of contributing states does not change much between 2002 and 2018.

<sup>4</sup> Environ. (2007, July 18). *CENRAP PSAT Visualization Tool*. (Corrected Version). Available on the CENRAP Projects webpage

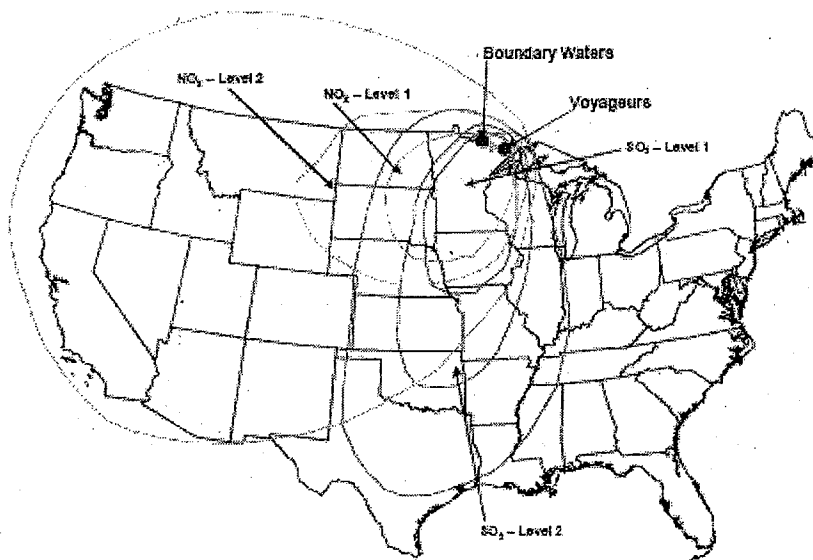
<sup>5</sup> Ibid.

### State Impacts on Minnesota's Class I Areas – Future Year (2018 PSAT)

LADCO PSAT Modeling (2018)			CENRAP PSAT Modeling (2018)	
	BWCAW	VNP	BWCAW	VNP
Michigan	2.6%	1.3%	2.2%	1%
Minnesota	30.5%	35.0%	19.8%	18.0%
Wisconsin	10.4%	6.3%	6.0%	3.1%
Illinois	5.2%	3.0%	3.7%	1.6%
Indiana	2.9%	1.6%	1.8%	0.8%
Iowa	7.6%	7.4%	2.9%	2.5%
Missouri	5.2%	4.3%	2.3%	1.6%
N. Dakota	5.7%	10.3%	3.7%	4.7%
TOTAL	70.1%	69.2%	42.5%	33.3%

The states with contributions over 5% to the Class I areas in these analyses generally match well with the impacting states shown in the Area of Influence (AOI) analysis done by Alpine Geophysics for CENRAP.

### AOIs for Minnesota's Class I Areas<sup>6</sup>



<sup>6</sup> Stella, G.M et al. (2006, May 9). *CENRAP Regional Haze Control Strategy Analysis Plan*. Prepared by Alpine Geophysics. Available on the CENRAP Projects webpage <http://www.cenrap.org/projects.asp>

## **Attachment 2: Outline of an Approach to Defining Reasonable Progress for Minnesota Class I Areas in the Minnesota Regional Haze SIP**

Under EPA rules, Minnesota has a responsibility to set a Reasonable Progress Goal (RPG) for visibility in the Boundary Waters and Voyageurs Park. Because the states that contribute to our Class I areas will submit their SIPs at different times, Minnesota sets forth the following proposal for setting a RPG for our two Class I areas. This document lays out the elements that we plan to include.

Minnesota's Long Term Strategy section will include those control strategies which we plan to undertake and which we consider to be reasonable. It will also include any known controls that are being undertaken in the nearby states, particularly the five states (IL, WI, ND, IA, and MO) that have been identified as contributors to BWCAW and VNP.

- Minnesota's LTS Contains
  - BART
    - For Minnesota: Minimal emission reductions
    - As known for other states
  - CAIR and resulting EGU reductions
    - For Minnesota
    - As known for other states
  - Control strategies for PM<sub>2.5</sub> and Ozone attainment SIPs
    - As known for other states
  - Other federal on-the-books (OTB) controls:
    - Tier II for on-highway mobile sources
    - Heavy-duty diesel (2007) engine standards
    - Low sulfur fuel standards
    - Federal control programs for nonroad mobile sources
  - Additional Emission Limitations
    - NE Minnesota Plan (30% reduction in combined SO<sub>2</sub>/NO<sub>x</sub> as a fair share)
    - Additional voluntary reductions as a result of MN Statutes 216B.1692 (emission reduction rider)
    - Anything known for other states
  - Other long term strategy (LTS) Components (without specific emission reductions)
    - Measures to mitigate emissions from construction
    - Source retirement and replacement
    - Smoke management for prescribed burns in Minnesota

After documenting all the components of the LTS, Minnesota will lay out the RPG determined for the best and worst days at VNP and BWCAW.

### ***Reasonable Progress Goals***

Once determined, the RPG submitted in Minnesota's SIP will represent an **interim, minimum** visibility improvement Minnesota would consider to be reasonable, and contain emission reductions resulting from the elements of the long term strategy.

At this time, Minnesota believes that this is an appropriate goal because other impacting states are working on a multi-SIP approach and have yet to determine what reductions are reasonable in their states for both haze and attainment purposes. Although we cannot compel the states to undertake reductions, Minnesota would expect further emissions reductions than are documented here, resulting in larger visibility improvement. Minnesota intends to revise the RPG for 2018 in the Five Year SIP Assessment, in order to reflect the additional control strategies found to be reasonable.

### **Steps in Reviewing Control Strategies and Revising RPG**

In reviewing additional control strategies to determine those that are reasonable under the Regional Haze rule, Minnesota will focus on strategies that will result in emission reductions in those states that are significant contributors to visibility impairment in either BWCAW or VNP: Minnesota, Wisconsin, Iowa, N. Dakota, Missouri and Illinois.

The MPCA commits to further evaluation of reasonable control strategies that are possible within Minnesota. Minnesota will work with the other contributing states through their submittals of the first haze SIP and through 2013 to develop reasonable control strategies.

In the Five Year SIP Assessment, the MPCA would submit enforceable documents for any additional control measures found to be reasonable within Minnesota. In addition, that report would contain a listing of the additional control measures to be implemented by the other contributing states. Minnesota would then submit modeling that includes all these enforceable measures and would revise the 2018 RPG to reflect the larger degree of visibility improvement expected from the chosen control strategies.

### **Specific Control Strategies to Be Reviewed**

Minnesota will use the EC/R five factor analysis report, the control cost analysis carried out by Alpine Geophysics for CENRAP and the CENRAP Control Sensitivity Model run to identify reasonable region-wide emission reduction strategies. (*See Attachment 3*).

The specific strategies that at this time appear to potentially be reasonable, and Minnesota's expectation for each of these strategies for other states, are outlined below.

#### **EGU SO<sub>2</sub> Reductions**

Minnesota will ask the contributing states to look at their EGU emissions of SO<sub>2</sub>; Minnesota will particularly focus on possible reductions in states with emission rates that appear to be higher than the average among the Midwestern states. Since contributor states face a variety of regulatory demands and fuel types, it may not be possible to attain uniform emission performance. An emission rate of about 0.25 lb/mmBTU should be achievable in a cost-effective manner; this is the level being achieved in Minnesota and Illinois, and the EC/R report



shows that the “EGU1” scenario, a 0.15 lb/mmBTU emission rate, is generally achievable in the Midwest at a reasonable \$/ton figure. (See Attachment 3).

Minnesota asks the identified states to demonstrate that reductions are occurring or being undertaken that will allow the state to reach at least the 0.25 lb/mmBTU emission rate, or to describe in their SIPs or Five-Year SIP Assessments why further reductions of SO<sub>2</sub> from EGU are not reasonable. Further reductions may not be reasonable due to the cost of implementation in \$/ton or \$/deciview or lack of impact on visibility impairment, but they should be evaluated.

At present, it appears as though Illinois has planned or proposed reductions that appear reasonable. It appears that more cost effective reductions are possible in Iowa, Missouri, North Dakota, and Wisconsin. Since Wisconsin is the largest non-Minnesota contributor to Minnesota’s Class I areas, their efforts to reduce EGU SO<sub>2</sub> emissions are particularly important.

#### EGU NO<sub>x</sub> Reductions

Wisconsin, Missouri, and Illinois have already reduced NO<sub>x</sub> emissions to alleviate ozone standard violations, and Iowa appears to already have relatively low EGU NO<sub>x</sub> emissions.

Minnesota will ask North Dakota to look at their EGU emissions of NO<sub>x</sub> and to describe in their SIP or Five-Year SIP Assessment why further reductions of NO<sub>x</sub> from EGU are not reasonable. Again, an emission rate of approximately 0.25 lb/mmBTU appears to be a reasonable benchmark. Further reductions may not be reasonable due to the cost of implementation in \$/ton or \$/deciview or lack of impact on visibility impairment, but they should be evaluated.

#### ICI Boiler Emission Reductions

Minnesota will commit to a more detailed review of potential NO<sub>x</sub> and SO<sub>2</sub> reductions from large ICI boilers. Regulations or permit limits will be developed by 2013 if significant cost effective reductions prove feasible from this sector. Minnesota will expect the five contributing states to make at least this level of commitment.

#### Other Point Source Emission Reductions

Reciprocating engines and turbines appear to be a sector with potential cost effective NO<sub>x</sub> controls. Minnesota commits to review this sector in more detail and if, after consideration of planned federal control programs, cost effective reductions appear feasible, Minnesota commits to develop regulations or permit limits for major sources by 2013. Minnesota will expect the five contributing states to make a similar commitment.

#### Mobile Source Emission Reductions

There appear to be relatively few cost effective NO<sub>x</sub> controls for transportation available to states. Minnesota commits to work with LADCO states to implement appropriate cost effective NO<sub>x</sub> controls to improve visibility and lower ozone levels in non-attainment areas.

#### NO<sub>x</sub> Modeling, Ammonia, Agricultural Sources

It is not appropriate to commit to control of ammonia sources at this time. However, there is a clear need to improve 1) our understanding of the role of ammonia in haze formation, 2) our understanding of potential ammonia controls, and 3) the accuracy of particulate nitrate

predictions. Minnesota does not consider it our responsibility to conduct such research. Minnesota therefore encourages EPA and the regional planning organizations to continue work in these areas and commits to work with EPA and the RPOs to these ends.

#### **Timeline for Reviewing Control Strategies**

Minnesota commits to reviewing these control strategies on such a timeline that the 2013 SIP Report will include the four factor analysis for these control strategies, and that any control strategies deemed to be reasonable will be in place with an enforceable document (state rule, order, or permit conditions). Although any control measures ultimately deemed to be reasonable may not be fully implemented by 2013, they will be clearly "on the way" and the SIP Report will include estimates of emission reductions and projected 2018 visibility conditions.

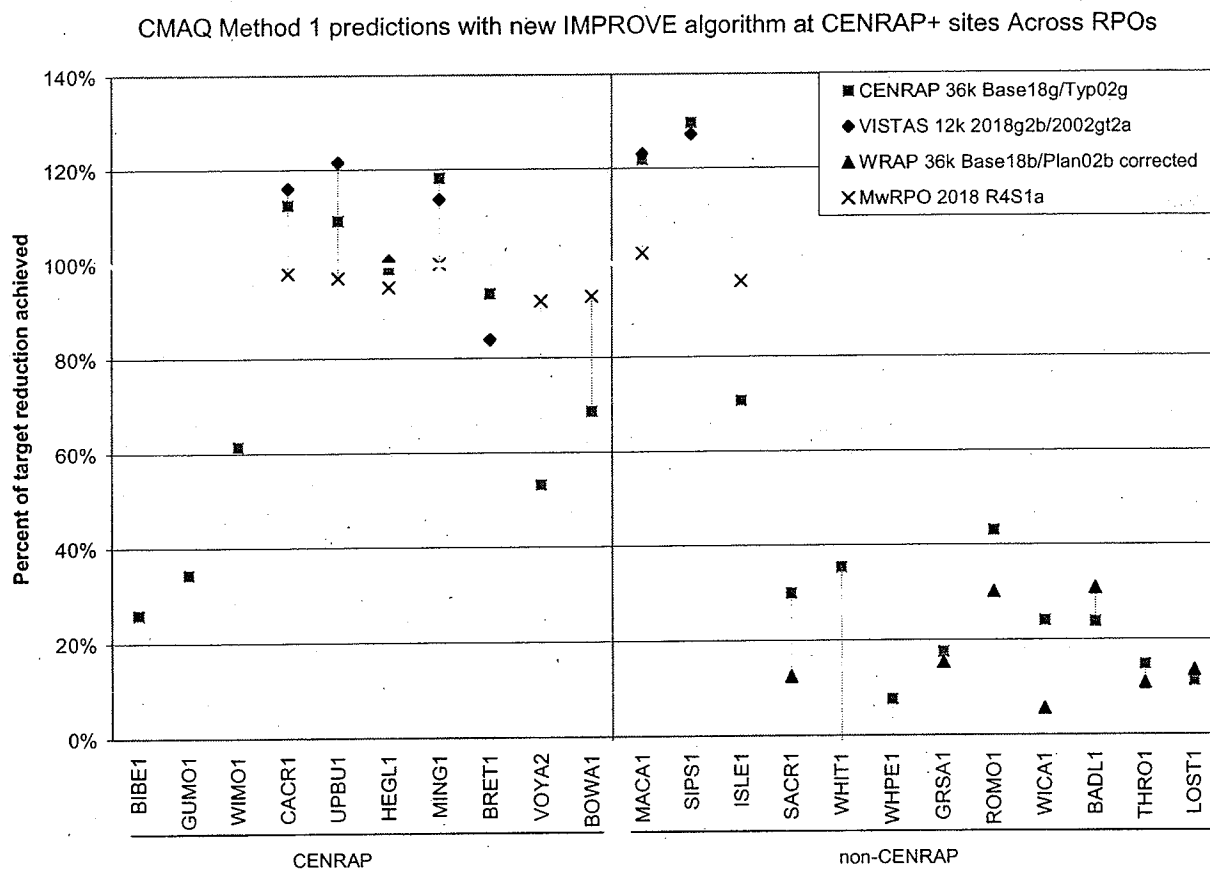
Acknowledging that most states are far along in the process of writing their Regional Haze SIPs, Minnesota would expect that all other contributing states would commit to a timeline that would allow reasonable predictions of the emission reductions and visibility improvement by 2018 from those states in the 2013 SIP Report.

### Attachment 3: Supporting Technical Information – Need for Additional Control Strategies

Although there are some fairly major differences in the degree of visibility improvement expected at VNP and BWCAW due to on- the- books controls, projections by both CENRAP and Midwest RPO show that Minnesota's Class I areas are not yet projected to meet the Uniform Rate of Progress, as shown in the graph below.<sup>7</sup> In this graph, the URP is the "target reduction."

EPA's recent guidance on determining the reasonable progress goal (RPG) indicates that states may set a RPG that provides for more, less, or equivalent improvement as the URP. However, the guidance continues to emphasize that an analysis of control strategies with the four factors is necessary; Minnesota believes this is particularly true in light of the lesser degree of visibility improvement shown from on- the- books controls in Minnesota's Class I Areas.

The EGU 2018 Summary table, following, shows projected 2018 EGU SO<sub>2</sub> and NO<sub>x</sub> emissions. Highlighted cells indicate specific states and pollutants of concerns, where Minnesota has requested evaluation of potential reasonable control measures.<sup>8</sup>



<sup>7</sup> Morris, R. (2007, July 24). *CENRAP Emissions and Modeling Technical Support Document*, Prepared by Environ. Presentation Given at CENRAP Workgroup/POG Meeting.

<sup>8</sup> Provided by Midwest RPO from the IPM 3.0 base run and edits made by certain states.

# EGU Summary for 2018

	Heat Input (MMBTU/year)	Scenario	SO2 (tons/year)	SO2 % Reduction (From 2001 - 03 Average)	SO2 (lb/MMBTU)	NOx (tons/year)	NOx % Reduction (From 2001 - 03 Average)	NOx (lb/MMBTU)
IL	980,197,198	2001 - 2003 (average)	362,417		0.74	173,296		0.35
	1,310,188,544	IPM3.0 (base)	277,337	23.5	0.423	70,378	59.4	0.107
		IPM3.0 - will do	140,296	61.3	0.214	62,990	63.7	0.096
		IPM3.0 - may do	140,296	61.3	0.214	62,990	63.7	0.096
IA	390,791,671	2001 - 2003 (average)	131,080		0.67	77,935		0.40
	534,824,314	IPM3.0 (base)	115,938	11.6	0.434	59,994	23.0	0.224
		IPM3.0 - will do	115,938	11.6	0.434	59,994	23.0	0.224
		IPM3.0 - may do	100,762	23.1	0.377	58,748	24.6	0.220
MN	401,344,495	2001 - 2003 (average)	101,605		0.50	85,955		0.42
	447,645,758	IPM3.0 (base)	61,739	39.2	0.276	41,550	51.7	0.186
		IPM3.0 - will do	54,315	46.5	0.243	49,488	42.4	0.221
		IPM3.0 - may do	51,290	49.5	0.229	39,085	54.5	0.175
MO	759,902,542	2001 - 2003 (average)	241,375		0.63	143,116		0.37
	893,454,905	IPM3.0 (base)	243,684	(1.0)	0.545	72,950	49.0	0.163
		IPM3.0 - will do	237,600	1.6	0.532	72,950	49.0	0.163
		IPM3.0 - may do	237,600	1.6	0.532	72,950	49.0	0.163
ND	339,952,821	2001 - 2003 (average)	145,096		0.85	76,788		0.45
	342,685,501	IPM3.0 (base)	41,149	71.6	0.240	44,164	42.5	0.258
		IPM3.0 - will do	56,175	61.3	0.328	58,850	23.4	0.343
		IPM3.0 - may do	56,175	61.3	0.328	58,850	23.4	0.343
WI	495,475,007	2001 - 2003 (average)	191,137		0.77	90,703		0.36
	675,863,447	IPM3.0 (base)	127,930	33.1	0.379	56,526	37.7	0.167
		IPM3.0 - will do	150,340	21.3	0.445	55,019	39.3	0.163
		IPM3.0 - may do	62,439	67.3	0.185	46,154	49.1	0.137

Minnesota also used the cost-curve analysis performed for CENRAP by Alpine Geophysics, originally included in the *CENRAP Regional Haze Control Strategy Analysis Plan* and updated in March 2007, to determine which states might have additional reasonable control strategies. The cost curves were used to perform a modeling run (the "Control Sensitivity Run") in order to determine the visibility improvement that could result from implementing certain control strategies.<sup>9</sup>

The following tables show which point sources are controlled in the CENRAP states that the MPCA has identified as contributing to visibility impairment in BWCAW and VNP (Iowa, Minnesota, Missouri) under the following assumptions: 1) a cost less than \$5000/ton, and 2) facility emissions divided by the facility's distance from any Class I area, is greater than or equal to five (often called the Q/5D criteria). The tables include sources that are within Q/5D of either VNP or BWCAW.

The report prepared for the MPCA and Midwest RPO by EC/R, entitled "Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis," also provides documentation that the various control strategies mentioned in Attachment 2 are likely to be reasonable, at least for some states. A summary table follows the tables of units controlled in the CENRAP control sensitivity run.<sup>10</sup>

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<sup>9</sup> Information on the Control Sensitivity run is available on CENRAP's Project website, <http://www.cenrap.org/projects.asp>, under the link entitled *Results from Control Sensitivity Run, Base18Gc1 - Cost Curve Criteria of 5k per ton, Q over 5D*.

<sup>10</sup> Battye, W. et al (2007, July 18). Reasonable Progress for Class I Areas in the Northern Midwest – Factor Analysis. Prepared for MPCA and MRPO by EC/R. [http://www.ladco.org/MRPO%20Report\\_071807.pdf](http://www.ladco.org/MRPO%20Report_071807.pdf). See Table 6.5-3, page 110.

# NOx Controls, Q/5D for BWCAW and VNP

State	County	Plant Name	Point ID	Source Type for Control	Control Measure	Tons Reduced	Annualized Cost (\$2005)	Cost Per Ton Reduced
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL NOR	148766	Utility Boiler - Coal/Wall	SCR	3739	\$5,252,502	\$1,405
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL SOU	147140	Utility Boiler - Coal/Wall - Other Coal	LNBO	1191	\$2,900,440	\$2,435
Iowa	Wapello	IPL - OTTUMWA GENERATING STATION	143977	Utility Boiler - Coal/Tangential	SCR	4708	\$13,000,038	\$2,761
Iowa	Pottawattamie	MIDAMERICAN ENERGY CO. - COUNCIL BLUFFS	143798	Utility Boiler - Coal/Wall - Other Coal	LNBO	671	\$2,960,866	\$4,413
Minnesota	Cook	MINNESOTA POWER - TACONITE HARBOR ENERGY	EU001	Utility Boiler - Coal/Tangential	SCR	411	\$1,536,959	\$3,737
Minnesota	Cook	MINNESOTA POWER - TACONITE HARBOR ENERGY	EU002	Utility Boiler - Coal/Tangential	SCR	411	\$1,574,337	\$3,828
Minnesota	Cook	MINNESOTA POWER - TACONITE HARBOR ENERGY	EU003	Utility Boiler - Coal/Tangential	SCR	411	\$1,592,948	\$3,873
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU004	Utility Boiler - Coal/Tangential - POD10	LNC3	806	\$1,413,275	\$1,753
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU003	Utility Boiler - Coal/Tangential - POD10	LNC3	600	\$884,162	\$1,474
Minnesota	Koochiching	Boise Cascade Corp - International Falls	EU320	Sulfate Pulping - Recovery Furnaces	SCR	361	\$939,170	\$2,603
Minnesota	St. Louis	MINNESOTA POWER INC - LASKIN ENERGY CTR	EU001	Utility Boiler - Coal/Tangential	SCR	1064	\$1,346,571	\$1,265
Minnesota	St. Louis	MINNESOTA POWER INC - LASKIN ENERGY CTR	EU002	Utility Boiler - Coal/Tangential	SCR	1063	\$1,346,571	\$1,267
Minnesota	St. Louis	EVTAC Mining - Fairlane Plant	EU042	ICI Boilers - Coke	SCR	1365	\$3,142,325	\$2,302
Minnesota	Sherburne	NSP - SHERBURNE GENERATING PLANT	EU002	Utility Boiler - Coal/Tangential - POD10	LNC3	998	\$1,873,316	\$1,877
Minnesota	Sherburne	NSP - SHERBURNE GENERATING PLANT	EU001	Utility Boiler - Coal/Tangential - POD10	LNC3	701	\$1,880,449	\$2,682
Missouri	Pike	HOLCIM (US) INC- CLARKSVILLE	16745	Cement Manufacturing - Wet	Mid-Kiln Firing	1808	\$149,510	\$83
Missouri	Randolph	ASSOCIATED ELECTRIC COOPERATIVE INC-THOM	17575	Utility Boiler - Coal/Wall - Other Coal	LNBO	682	\$3,114,256	\$4,563

# SO<sub>2</sub> Controls, Q/5D for BWCAW or VNP

State	County	Plant Name	Point ID	Source Type for Control	Control Measure	Tons Reduced	Annualized Cost (\$2005)	Cost Per Ton Reduced
Iowa	Muscatine	CENTRAL IOWA POWER COOP. - FAIR STATION	100125	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	4504	\$5,854,468	\$1,300
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL NOR	148766	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	11440	\$20,886,351	\$1,826
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL NOR	148765	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	7020	\$13,365,237	\$1,904
Iowa	Woodbury	MIDAMERICAN ENERGY CO. - GEORGE NEAL SOU	147140	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14255	\$35,558,570	\$2,494
Iowa	Wapello	IPL - OTTUMWA GENERATING STATION	143977	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	15894	\$40,687,209	\$2,560
Iowa	Louisa	MIDAMERICAN ENERGY CO. - LOUISA STATION	147281	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	12964	\$36,698,267	\$2,831
Iowa	Pottawattamie	MIDAMERICAN ENERGY CO. - COUNCIL BLUFFS	143798	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	12141	\$36,299,373	\$2,990
Iowa	Des Moines	IPL - BURLINGTON GENERATING STATION	145381	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5384	\$17,059,783	\$3,169
Iowa	Allamakee	IPL - LANSING GENERATING STATION	145136	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5926	\$19,213,055	\$3,242
Iowa	Clinton	IPL - M.L. KAPP GENERATING STATION	144559	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5036	\$17,331,069	\$3,441
Iowa	Linn	IPL - PRAIRIE CREEK GENERATING STATION	144096	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	3753	\$13,730,673	\$3,658
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU001	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	2329	\$9,472,980	\$4,068
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU002	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	2315	\$9,472,980	\$4,092
Minnesota	Itasca	MINNESOTA POWER INC - BOSWELL ENERGY CTR	EU004	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	7403	\$30,486,914	\$4,118
Missouri	Clay	INDEPENDENCE POWER AND LIGHT-MISSOURI CI	5430	Utility Boilers - Very High Sulfur Content	FGD Wet Scrubber	8058	\$6,232,581	\$774
Missouri	Franklin	AMERENUE-LABADIE PLANT	6964	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14741	\$34,190,931	\$2,319

State	County	Plant Name	Point ID	Source Type for Control	Control Measure	Tons Reduced	Annualized Cost (\$2005)	Cost Per Ton Reduced
Missouri	Franklin	AMERENUE-LABADIE PLANT	7408	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14988	\$34,874,750	\$2,327
Missouri	Franklin	AMERENUE-LABADIE PLANT	7262	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14912	\$34,874,750	\$2,339
Missouri	Jefferson	AMERENUE-RUSH ISLAND PLANT	11565	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	13979	\$32,994,250	\$2,360
Missouri	Franklin	AMERENUE-LABADIE PLANT	7087	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14285	\$34,019,977	\$2,382
Missouri	Henry	KANSAS CITY POWER & LIGHT CO-MONTROSE GE	7847	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	6362	\$15,425,097	\$2,425
Missouri	Henry	KANSAS CITY POWER & LIGHT CO-MONTROSE GE	7849	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	6191	\$15,134,675	\$2,445
Missouri	Jefferson	AMERENUE-RUSH ISLAND PLANT	11563	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	13276	\$32,994,250	\$2,485
Missouri	Henry	KANSAS CITY POWER & LIGHT CO-MONTROSE GE	7848	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	5928	\$14,840,835	\$2,504
Missouri	St. Louis	AMERENUE-MERAMEC PLANT	21421	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	8494	\$21,733,761	\$2,559
Missouri	St. Louis	ANHEUSER-BUSCH INC-ST. LOUIS	20274	Bituminous/Subbituminous Coal (Industrial Boilers)	SDA	1996	\$5,303,934	\$2,658
Missouri	Platte	KANSAS CITY POWER & LIGHT CO-IATAN GENER	16912	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	14332	\$38,179,875	\$2,664
Missouri	Jackson	AQUILA INC-SIBLEY GENERATING STATION	9953	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	9166	\$24,430,935	\$2,665
Missouri	St. Louis	AMERENUE-MERAMEC PLANT	21423	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	7081	\$19,721,240	\$2,785
Missouri	Randolph	ASSOCIATED ELECTRIC COOPERATIVE INC-THOM	17575	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	9469	\$38,179,875	\$4,032
Missouri	New Madrid	ASSOCIATED ELECTRIC COOPERATIVE INC-NEW	14944	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	8132	\$33,051,234	\$4,064
Missouri	New Madrid	ASSOCIATED ELECTRIC COOPERATIVE INC-NEW	14942	Utility Boilers - Medium Sulfur Content	FGD Wet Scrubber	8026	\$33,051,234	\$4,118
Missouri	Jefferson	DOE RUN COMPANY-HERCULANEUM SMELTER	11722	Primary Metals Industry	Sulfuric Acid Plant	10653	\$46,396,391	\$4,355



**Table 6.5-3. Summary of Visibility Impactes and Cost Effectiveness of Potential Control Measures**

Emission category	Control strategy	Region	Pollutant	Average estimated visibility improve- ment for the four Midwest Class I areas (deciviews)	Cost effectiveness (\$/ton)	Cost effectiveness per visibility improvement (\$million/ deciview)
EGU	EGU1	3-State	SO2	0.32	1,540	2,249
			NOX	0.06	2,037	2,585
		9-State	SO2	0.74	1,743	2,994
			NOX	0.17	1,782	2,332
	EGU2	3-State	SO2	0.41	1,775	2,281
			NOX	0.09	3,016	3,604
		9-State	SO2	0.85	1,952	3,336
			NOX	0.24	2,984	4,045
ICI boilers	ICI1	3-State	SO2	0.055	2,992	1,776
			NOX	0.043	2,537	1,327
		9-State	SO2	0.084	2,275	2,825
			NOX	0.068	1,899	2,034
	ICI Workgroup	3-State	SO2	0.089	2,731	1,618
			NOX	0.055	3,814	1,993
		9-State	SO2	0.136	2,743	3,397
			NOX	0.080	2,311	2,473
Reciprocating engines and turbines	Reciprocating engines emitting 100 tons/year or more	3-State	NOX	0.015	538	282
		9-State	NOX	0.052	506	542
	Turbines emitting 100 tons/year or more	3-State	NOX	0.008	754	395
		9-State	NOX	0.007	754	810
	Reciprocating engines emitting 10 tons/year or more	3-State	NOX	0.037	1,286	673
		9-State	NOX	0.073	1,023	1,095
	Turbines emitting 10 tons/year or more	3-State	NOX	0.011	800	419
		9-State	NOX	0.012	819	880
Agricultural sources	10% reduction	3-State	NH3	0.10	31 - 2,700	8 - 750
		9-State	NH3	0.16	31 - 2,700	18 - 1,500
	15% reduction	3-State	NH3	0.15	31 - 2,700	8 - 750
		9-State	NH3	0.25	31 - 2,700	18 - 1,500
Mobile sources	Low-NOX Reflash	3-State	NOX	0.007	241	516
		9-State	NOX	0.010	241	616
	MCDI	3-State	NOX	0.015	10,697	7,595
		9-State	NOX	0.015	2,408	4,146
	Anti-Idling	3-State	NOX	0.009	(430) - 1,700	(410) - 1,600
		9-State	NOX	0.006	(430) - 1,700	(410) - 1,600
	Cetane Additive Program	3-State	NOX	0.009	4,119	3,155
		9-State	NOX	0.008	4,119	10,553



#### **Attachment 4: Organizations Participating in Northern Class I Consultation Process**

##### *States and Provinces*

Illinois Environmental Protection Agency  
Indiana Department of Environmental Management  
Iowa Department of Natural Resources  
Michigan Department of Environmental Quality  
Minnesota Pollution Control Agency  
Missouri Department of Natural Resources  
North Dakota Department of Health  
Wisconsin Department of Natural Resources  
Ontario Ministry of the Environment

##### *Tribes*

Leech Lake Band of Ojibwe  
Fond du Lac Band of Lake Superior Chippewa  
Mille Lacs Band of Ojibwe  
Upper and Lower Sioux Community  
Red Lake Band of Chippewa  
Grand Portage Band of Chippewa  
Nottawaseppi Huron Band of Potawatomi

##### *Regional Planning Organizations*

Midwest Regional Planning Organization  
Central Regional Air Planning Association

##### *Federal Government*

USDA Forest Service  
U.S. Fish and Wildlife Service  
National Park Service  
USDA Forest Service  
Environmental Protection Agency, Region 5

